

CA Fast Unload & CA Fast Load for DB2 for z/OS **Best practices**

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CA Fast Unload & Fast Load for DB2 for z/OS best practices - Agenda

- CA Fast Unload for DB2 best practices
 - product customization
 - maintaining data integrity,
 - maximizing performance
 - reducing CPU time.
 - automating the creation of test tables
 - restarting jobs
 - Usability
- CA Fast Load for DB2 best practices
 - Sort
 - Performance
 - Usability
 - Functionality



- Customization: create a **PFU** parmlib member
- specify site-specific default values for CA Fast Unload® for DB2 for z/OS keywords
- PFU parmlib member can contain any CA Fast Unload® for DB2 for z/OS syntax.
- Syntax in the "**PFU**" member is the same as in job.
- Keyword values specified will work as default settings.
- Recommended
 - SORTNUM, SORTDEV
 - SQL-ACCESS EXTENSION
 - PRINT-OPTIONS PTIMSG or ALLMSGS
 - EMPTY-RC: allow RC 04 when no rows for a SELECT
 - DISPLAY-STATUS



CA Fast Unload for DB2 for z/OS best practices - Customization: compatibility

DB2 Compatibility Matrix

Compatibility/Release	18.0	19.0	20.0
Db2 V9	NO	NO	NO
Db2 V10	YES PTFs	YES PTFs	YES PTFs
Db2 V11	YES PTFs	YES PTFs	YES PTFs
Db2 V12	NO	YES PTFs Info	YES PTFs Info

Pervasive Encryption Compatibility Matrix

Compatibility/Release	18.0	19.0	20.0
Pervasive Encryption z/OS V2R2	NO	TBD	TBD
Pervasive Encryption z/OS V2R3	NO	TBD	TBD

BM zEnterprise Compatibility Matrix

Compatibility/Release	18.0	19.0	20.0
zEC12	YES	YES	YES
zBC12	YES	YES	YES
z13/z13s	YES	YES	YES
z14	YES PTFs	YES PTFs	YES PTFs



- Data integrity: Unload access type
- SQL-ACCESS [<u>NONE</u>|ONLY|EXTENSION]|
 - NONE: SELECT statement processed natively (outside DB2)
 - Best performance
 - Less impact on DB2 workload
 - Required to unload from an image copy
 - SHRLEVEL keyword specifies the data integrity level
 - ONLY: SELECT statement processed by DB2
 - EXTENSION: SELECT statement processed natively when possible, switching to DB2 when not supported.
 - Mix of NONE and ONLY options.



- Data Integrity: SHRLEVEL
- SHRLEVEL only applicable to SQLs executed natively.
- With data integrity
 - SHRLEVEL REFERENCE:
 - SQL-ACCESS NONE or EXTENSION.
 - Table data buffers quiesced.
 - MULTI-LOCKING: common point of consistency for unloaded data across all SELECT statements.
 - PART-INDEPENDENCE YES
 - Consider using alternative input dataset formats INPUT-FORMAT
 - IMAGECOPY,
 - DSN1COPY
 - CONCURRENT COPY
- Without data integrity: "dirty read". Concurrent access.
 - SHRLEVEL CHANGE
 - CHANGE BP-LOOKUP, QUIESCE | NO-QUIESCE
 - SHRLEVEL IGNORE



- Data Integrity: considerations
- STOPPED-TS [NO|YES]
 - specifies whether to unload a table from a stopped tablespace.
 - Full integrity...if STOP status is under control
- REFERENCE-TS-COPY [NO|YES]
 - used with SHRLEVEL REFERENCE
 - unloads tablespace that is in RW, COPY status.
 - Status prevents a quiesce from being performed, therefore data pages might still be in DB2 buffers.
 - Data integrity at risk: "dirty read".



- Maximize performance
- Allocate sort work datasets dynamically
 - Omit STxxWKnn and STxxMSG ddnames
 - Include SORT dynalloc parameters
 - SORTDEV device-type
 - SORTNUM # temporary datasets
 - Include ESTIMATED-ROWS in every SELECT under SELECT-OPTIONS parameter to facilitate an optimal temporary and output datasets allocation.
- Optimize input/output processing
 - COPY-BUFFERS: for IMAGCOPY and DSN1COPY zOS input datasets
 - VSAM-BUFFERS: for DB2 ESDS dataset...if SQL-ACCESS NONE.
 - IO-BUFFERS: for SYSREC output datasets
 - ...but avoid system paging



- Maximize performance
- Optimize SELECT statements processing:
 - Include several SELECTs in a single step
 - SQL-ACCESS ONLY / EXTENSION
 - CURRENT-DEGREE [NONE|ANY|1]
- Setting the data INPUT-FORMAT
 - TABLE:
 - required to unload LOB data
 - zIIP processing when processed natively (SQL-ACCESS NONE)
 - Temporal tables support
 - Copies: DSN1COPY / CONCURRENTCOPY (DFSMS) / FLASHCOPY / IMAGCOPY / INCREMENTAL / INLINE (Reorg)
 - DDLDDN—Retrieve DDL from a Data Set...if not consistent with catalog



CA Fast Unload for DB2 for z/OS best practices - Reducing CPU

- Setting the data OUTPUT-FORMAT
 - Avoid data conversion parameters: DATE, TIME, fieldprocs, etc
 - LOAD: IBM Load compatibility. Best performance.
 - NEWOBID: Specify the OBID of the table to be loaded.
 - required to unload LOB data
 - zIIP processing when processed natively (SQL-ACCESS NONE)
 - Temporal tables support
 - VARIABLE: if variable length columns present. Required for XML columns
 - DSNTIAUL: IBM DSNTIAUL compatibility. FB.
 - FIXED: FB dataset, If variable length columns present, padded.
 - COMMA-DELIMITED: IBM IND\$FILE file-transfer compatibility.
 - VARIABLE,[DB2LOAD|FASTLOAD|XMLDB2V9]|EXTERNAL}
 - DSNTIAUL:



[•] Avoid data conversión parametersion DATE, Allin ME, dieldprocs, etc

- CPU time saving
- INPUT FORMAT
 - TABLE
 - SQLACCESS NONE / EXTENSION
- OUTPUT-FORMAT
 - DSNTIAUL: avoid
 - INTO
 - TRIM
 - DATE/TIME types column with a LOCAL date/time exits
 - Field procedures on any column
 - ASCII, CCSID, EBCDIC, and UNICODE keywords
 - COMMA-DELIMITED / LOAD
 - DATE/TIME types column with a LOCAL date/time exits
 - Field procedures on any column
 - ASCII, CCSID, EBCDIC, and UNICODE keywords



- Reducing CPU: zIIP processing
- Requirements:
 - ZIIP {YES|NO}
 - A single SELECT statement
 - multiple SELECTs are not allowed
 - INPUT-FORMAT TABLE
 - SQL-ACCESS NONE (or EXTENSION if statement processed natively)



- Automate creation of tables for TEST environments
- Creation of single tables in the same or different DB2s.
- Created tables can contain some or all columns from the original table.
- These test tables can also have added column data initialized based on various criteria.
- SELECT statement specification
 - literals
 - columns to unload.
 - field specifications in the INTO clause to specify alternate column formatting for the unloaded data.
 - mask sensitive client data by including one or more DEFAULTIF (condition) INITIAL (value) clauses for each column.
 - The LIMIT keyword lets you limit the total number of rows to unload (sampling).



- Automate creation of tables for TEST environments
- SAMPLE: unloads a sample of data from your table.
 - SAMPLE $\{x|(,y)|(x,y)\}$ unloads x rows every y selected rows
 - Specify at global option or within SELECT-OPTIONS
- SELECT statement specification
 - literals
 - columns to unload.
 - field specifications in the INTO clause to specify alternate column formatting for the unloaded data.
 - mask sensitive client data by including one or more DEFAULTIF (condition) INITIAL (value) clauses for each column.
 - The LIMIT keyword lets you limit the total number of rows to unload (sampling).



- Automate creation of tables for TEST environments
- DDL-CONTROL keyword:
 - generates CREATE TABLE DDL statements
 - Only compatible with SQL-ACCESS NONE
 - DDL-CONTROL [**NONE**|INTABLE[,ONLY]|OUTTABLE[,ONLY]|BOTH[,ONLY]]
 - Output to CTLDDN template-name | ddname
- LOAD-CONTROL keyword:
 - IBM format
 - CA Fast Load format



- restarting jobs
- Restart possibilities if a Fast Unload job fails:
 - At job level
 - At utility statement level
 - At utility phase level
- Execution requirements for job restarting
 - specifying AUTO-RESTART YES in *hlq*.CDBAPARM(UTIL) and
 - specifying a RESTART parameter in the EXEC statement of your failed job
 - RESTART(PHASE):
 - Restart from failed utility statement
 - Execute subsequent utility statements without a restart parameter value.
 - RESTART(BYPASS),
 - RESTART from failed utility statement
 - BYPASS; subsequent statements are skipped the BYPASS option
 - RESTART(TERM):
 - RESTART from failed utility statement
 - TERM; delete restart rows. Does not execute subsequent statements.



- Performance and support recommendations
 - INPUT-FORMAT TABLE: <u>required</u>
 - Other INPUT-FORMAT options (DSN1COPY, IC,..) do not support LOB columns
 - SQL-ACCESS NONE: PFU direct reading
 - zIIP processing
 - Multitasking
 - Decrease ssidDBM1 overhead...subsystem workload
 - Possibility to specify partitions of a LOB tablespace
 - ONLY and EXTENSION also supported...in case of code character translations
 - OUTPUT-FORMAT VARIABLE
 - Compatible with IBM LOAD and CA Fast Load
 - Disk space used more effectively
 - If output dataset length > 32K: RECFM=VBS
 - OUTPUT-FORMAT EXTERNAL: no LOB support



- Elapsed time saving
- Multitasking
 - At partition level
 - PART
 - Partitions to unload: all, range, list....any combination
 - PART-INDEPENDENCE [NO|YES]
 - Access to non-eligible partitions to unload by other processes.
 - Skip the "global" lock at partitioned tablespace level. (native mode)
 - PART-SEPARATE {**NO**|YES}
 - One unload subtask per partition
 - Even at SELECT level



- Elapsed time saving
- Multitasking capability
 - Automatic under following syntax conditions
 - SQL-ACCESS NONE
 - INPUT-FORMAT TABLE
 - TAPE-STACK NO (or omitted)
 - Multitasking level
 - 1 unload task per tablespace: for non-partitioned tablespaces
 - 1 unload task per SELECT: for partitioned tablespaces



- Elapsed time saving
- Multitasking: Process Summary Report capability

PSR** FAST UNLOAD PROCESS SUMMARY REPORT sk OUICK FIND KEYS: PSR PROCESS SUMMARY REPORT PTFU261 - TASK #01 -- MESSAGE DDNAME: PTTMSG01 -- MAX RC: 00 TNCLUDES: PTFU263 - TASK #01 -- FLAPSED DISPATCH TIME: 00:00:10.51 PTEU261 - TASK #02 -- MESSAGE DDNAME: PTTMSG02 -- MAX RC: 04 TNCLUDES: PTFU263 - TASK #02 -- ELAPSED DISPATCH TIMF: 00:00:07.43

PTFU290 - TOTAL UNITS OF WORK PROCESSED: 02 - MAX CONCURRENT TASKS: 02



- Usability
- TEMPLATE: Dynamic Allocation Parameters for Output Data Sets
 - Not a FASTUNLOAD keyword
 - Define naming conventions for SYSREC, SYSDDL, SYSCTL
 - If present in SYSIN,
 - specify before FASTUNLOAD control statement
 - Ommit SYSTEMPL DD statement
 - TEMPLATE template-name

DSN *name-expression* (accept symbolics: &DB../TS..p&PA)

[common-options]

[disk-options | tape-options]



- Usability

- **OUTPUT-FORMAT** {**LOAD**|FIXED|DSNTIAUL|COMMA-DELIMITED|VARIABLE,[DB2LOAD|FASTLOAD|XMLDB2V9]|EXTERNAL}
 - LOAD: IBM unload format. Compatible with IBM LOAD and CA FastLoad
 - FIXED: output fields padded to maximum length
 - DSNTIAUL IBM DSNTIAUL format. output fields padded to maximum length
 - COMMA-DELIMITED PC format. Delimiter character.
 - VARIABLE VB/VBS
 - DB2LOAD
 - FASTLOAD
 - XMLDB2V9 obsolete
 - EXTERNAL



- Sort
- Performance
- Usability
- Functionality



- Customization: create a PFL parmlib member
- specify site-specific default values for CA Fast Load® for DB2 for z/OS keywords
- PFL parmlib member can contain any CA Fast Load® for DB2 for z/OS syntax.
- The keyword syntax in PFL member same as in a job.
- Keyword values specified will work as default settings.
- Recommended
 - SORTNUM, SORTDEV
 - SQL-ACCESS EXTENSION
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CA Fast Load for DB2 for z/OS best practices - Sorting

- Dynamic allocation
 - SORTDEV
 - SORTNUM
 - MAXTASK: [n/AUTO] concurrent sort tasks
 - The calculation is based on how many indexes the target table has
- Volume of information
 - Existing rows in target table: TOTALROWS value in SYSIBM.SYSTABLESPACESTATS (RTS) table is used. If 0 or null, the CARDF value from DB2 catalog. ESTIMATED-ROWS keyword omitted.
 - Input records to load in SYSULD: If information is compress and/or with LOB/VARCHAR data, specify ESTIMATED-INPUT keyword



- Sorting: CA Utility Sort
- CA partners with Syncsort
 - Use Syncsort as a sort program in PRR, PFL, PLA
 - CA Utility Sort
 - API to communicate with sort program
- Advantages
 - Optimize the sort dynamically based on the workload to be sorted
 - Utilization of block mode user exits provides additional performance improvement and zIIP offload



- Performance: Integration with other utilities
- Integration: COPY & STATS when LOAD REPLACE
 - Copy processing
 - COPY-BUFFERS: I/O buffers to allocate for CA Quick Copy.
 - COPY-EXCP:
 - Runstats processing:
 - DB2 catalog: UPDATE-CATSTATS
 - Call IBM RUNSTATS:
 - RSD: RUNSTATS TABLESPACE tsname TABLE ALL INDEX ALL
 - RSP: RUNSTATS TABLESPACE tsname USE PROFILE TABLE ALL
 - Test option [RSDT, RSPT]: REPORT YES UPDATE NONE
 - Real Time Stats: UPDTE-RTS-TABLES YES in hlq.CDBAPARM (UTIL).
 - Keeping RTS updated, application queries are optimized without additional RUNSTATS utility being executed.
 - PDA statistics: UPDATE-PDASTATS



- Performance: Input datasets
- INPUT-FORMAT:
 - SEQ: default. FB, VB, VBS.
 - IBM DSNTIAUL unload format compatibility
 - UNLOAD
 - An IBM REORG with the UNLOAD ONLY option
 - A CA FAST UNLOAD with the OUTPUT-FORMAT LOAD option
 - A discard data set from CA Rapid Reorg® for DB2 for z/OS
 - An exceptions data set from CA Fast Check® for DB2 for z/OS
 - The column definitions of the source and target tables must match.
 - No data or character conversions occur. CPU savings.
 - INTERNAL: IBM UNLOAD job with FORMAT INTERNAL
 - DELIMITED: delimiter character for columns



- Performance: output Db2 spaces
- OUTPUT-CONTROL BUILD: load TS directly from input.
 - Writes the input data from one or more SYSULD data sets directly into the tablespaces and indexspaces.
 - No intermediate data sets are used.
 - This load type reduces I/O, reduces disk storage needs and speeds processing.
 - Rrecommended with
 - REPLACE keyword
 - No duplicated unique index entries: discard processing avoidance.
 - No out of sequence index entries: discard processing avoidance, if RECLUSTER NO (input data expected in clustered order)
 - RECLUSTER NO with OUTPUT-CONTROL BUILD also minimizes the workspace DASD by eliminating the need for sort work data sets.



- Performance: output Db2 spaces
- Index processing
 - IXBUFFER-SIZE: Buffer Size for Index Processing.
 - NO-DUPLCHECK—Bypass Check for Duplicate Index Keys when OUTPUT-CONTROL REORG

- Partitioned tablespaces
 - Load from different input datasets: INDDN ddname
 - Concatenate datasets under 1 ddname in case the information for a specific partition spreads into more tan one dataset.
 - If LRECLs different, greater first in the concatenation



- Performance: Unix pipes
- UNIX Pipes in zOS/USS
 - Alternative to
 - BMC: MainView Batch Optimizer Job Optimizer Pipes
 - IBM BatchPipes
 - BatchPipes maintains a *short* queue of records being passed between "writer" and "reader" processes, and concurrently.
 - Provide better performance and cost reduction
 - Elapsed and CPU time savings.
 - zIIP offload



- Usability
 - Column order specification for an INPUT-FORMAT DELIMITED process.
 - process the output data from IBM UNLOAD jobs that specify FORMAT INTERNAL.
 - Index building with existing duplicated keys: OUTPUT-CONTROLALL
 - Data sharing support: subgroup



CA Fast Load for DB2 for z/OS best practices - Usability:

- File Clean-up: DELETE-FILES automatic deletion
 - only if SYSRECxx, SYSUT1xx, and SYSERR allocated manually
 - Only if LOAD completes successfully
 - Specified as a global option, where it applies to the entire job.
 - Format: DELETE-FILES [YES|NO]
 - DELETE-FILES YES: forces deletion of output datasets
 - SYSRECxx
 - SYSUT1xx
 - SYSERR: only if corresponding SYSDISC is empty
 - DELETE-FILES NO: honours value of DISP DD parameter for every dataset



- Functionality
 - Fast Load Resume Critical
 - Provide Load Resume processing without having to take the object offline.
 - Eliminate object outage when loading additional data.
 - Fast Load Replace with Fast Switch
 - Eliminate object outages when reloading tables with new data.
 - Eliminate outages when replacing read only tables with refreshed data.



- Functionality: Online Load Resume...Why?
- 24/7 environment
- Active tables
- Data updates needed
- High data availability required

- How to add information with no business impact?

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CA Fast Load for DB2 for z/OS best practices - Functionality : Online Load Resume...Solution





CA Fast Load for DB2 for z/OS best practices - Functionality: Online Load Resume...Sample JCL





CA Fast Load for DB2 for z/OS best practices - Functionality: Online Load Resume...results

Successful online load

Failed online load



- Functionality: Online Load Resume...Summary
- Use case
 - 24/7 environment
 - Active tables
 - Data updates needed
 - High data availability required
- CA Fast Load for DB2
 - DATA-AVAILABLE CRITICAL
 - COMMIT-FREQUENCY
 - RESUME YES



- Functionality: Online Load Replace...Summary

- Online Load Replace
 - 24/7 environment
 - Active tables initialization
 - Data refresh needed at regular intervals
 - High data availability required
 - How to **replace** information with no business impact?





- Functionality: Online Load Replace...Summary
- Online Load Replace: Parametrization
 - <u>DATA-AVAILABLE HIGH</u> to invoke the fast switch function, create shadow copies, and keep the original tablespace in read-only (RO) mode during the load.
 - <u>OUTPUT-CONTROL BUILD</u> to load the data directly from the input file.
 - <u>RESUME NO REPLACE</u> to indicate that you are <u>replacing</u> the original table data (not adding more data to it).



- Functionality: Online Load Replace...Syntax





- Functionality: Online Load Replace...Process







- Functionality: Online Load Replace...FastSwitch
- Successful fast switch: PFL0173I

Α	В	С
ххх	ХХХ	ХХХ
ууу	ууу	ууу
ZZZ	ZZZ	ZZZ

Original table

(catname.DSNDBx.db.sn.**10001**)

Shadow table

Α	В	С
XXX	aaa	XXX
ууу	ууу	bbb
ZZZ	ZZZ	ZZZ

(catname.DSNDBx.db.sn.**J0001**)



- Functionality: Online Load Replace...Process
- Successful fast switch: PFL01731

- Failed fast switch: PFL0172I

PFL0170I - Processing started for FASTSWITCH at 16:40:29 on 05-25-2017
......
PFL0171E - UPM CONNECT FAILED for FASTSWITCH UPM RC=0008
PFL0173I - FASTSWITCH deletion of old primary data sets - BYPASSED
PFL0172E - FAILED to FASTSWITCH RC=0008 RSN=0021
PFL0170I - Processing ended for FASTSWITCH at 16:40:29 on 05-25-2017



- Functionality: Online Load Replace...Summary
- Use case: Data Replacement
 - 24/7 environment
 - Large reference tables
 - Data refresh at regular intervals
 - High data availability required
- Fast switch load: Online Load Replace
 - DATA-AVAILABLE HIGH
 - OUTPUT-CONTROL BUILD
 - RESUME NO REPLACE





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Thank You.



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Call for Speakers Now Open





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